A Cross-Sectional Correlation Investigation Between Musculoskeletal Disorders and Mental Health Conditions Among Malaysian Adults

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ABSTRACT

This study investigates the bidirectional relationship between musculoskeletal disorders (MSDs) and psychological distress among working-age Malaysian adults. A cross-sectional design was employed using the Nordic Musculoskeletal Questionnaire (NMQ) and the Depression, Anxiety, and Stress Scale (DASS-21) to assess symptom prevalence and severity. Participant data were analyzed using Kendall's Tau-b (Tb) correlation to evaluate ordinal associations between specific upper limb MSD regions and mental health conditions. Findings indicated a high prevalence of mild upper limb musculoskeletal symptoms (70.5%) and notable levels of anxiety within the participants. Crucially, the correlation analysis revealed a statistically significant, moderate positive association exclusively between the severity of upper back pain and all three psychological distress domains: depression (Tb = 0.337, p = 0.040), anxiety (Tb = 0.331, p = 0.039), and stress (Tb = 0.337, p = 0.040). Other upper limb regions exhibited no significant correlations. The results highlight a localized psychosomatic vulnerability, demonstrating that psychological distress significantly interacts with physical discomfort in the upper back. This underscores the critical necessity for holistic occupational health interventions that concurrently address ergonomic risks and provide robust psychological support.

Keywords: Musculoskeletal disorders, Mental health, Anxiety and depression, Ergonomics, Malaysia adult

1. INTRODUCTION

Mental health issues have become prevalent nowadays, just as physical health concerns have after the pandemic. Individuals without preexisting mental health conditions were at risk of developing new mental health disorders, while those already diagnosed were susceptible to relapse or the emergence of additional disorders [1]. In Malaysia, the government-imposed restrictions aimed at curbing the virus's spread inadvertently contributed to a rise in mental health disorders. It was reported that 45% of study participants experienced stress due to movement control measures [2]. Similarly, another research finding suggested that these restrictions, while necessary for public health, inadvertently exacerbated mental health challenges among the population [3].

Research has also highlighted the disproportionate impact of the pandemic on specific occupational groups. It was found that female Malaysian teachers exhibited a higher susceptibility to depression (43.9%) compared to their male counterparts (40%) [4]. Various factors, including heavy workloads and student-related stressors, contributed to the onset of depression among teachers. Additionally, the manufacturing sector also reported an increase in mental health issues, which were attributed to inadequate employee welfare and excessive workloads. These conditions led to decreased job performance and increased the risk of workplace accidents [5].

Healthcare workers were particularly affected by the mental health consequences of the pandemic. Overburdened with excessive workloads and prolonged exposure to psychological stress, they faced heightened risks of developing mental health disorders [6]. The relentless influx of patients left little room for personal time or relaxation, further exacerbating mental health deterioration. Moreover, the constant risk of infection from COVID-19 patients contributed to heightened anxiety and psychological distress among healthcare professionals [7].

Finally, mental health disorders have been identified as a contributing factor to musculoskeletal disorders. A study examined the correlation between mental health disorders and musculoskeletal conditions among coal miners, revealing that occupational stress and psychological distress significantly contributed to musculoskeletal disorders [8].
Therefore, this study aims to analyse the prevalence of musculoskeletal disorders among Malaysian adults, assess the mental health conditions affecting this population, and explore the correlation between MSD and mental health to provide evidence-based insights that can inform targeted interventions and public health strategies.

2. LITERATURE REVIEW

2.1 Prevalence of Musculoskeletal Pain

Musculoskeletal pain, particularly in the upper limbs (i.e., neck, shoulders, upper back, elbows, and wrists/hands) and lower limbs (i.e., low back, hips/thighs, knees, and ankles/feet), is widespread among adult populations. According to the Nordic Musculoskeletal Questionnaire (NMQ), upper limb pain is more common than lower limb pain, with studies indicating that upper body pain is often exacerbated by work-related factors such as prolonged sitting and repetitive movement [9]. In fact, 70.5% of individuals in the current study reported experiencing mild upper limb pain, with lower limb pain being less prevalent, as indicated by 48.9% of participants reporting mild discomfort in the lower back, hips, and knees.

A systematic review by Guduru, the author highlighted that office workers and those in sedentary professions are particularly prone to musculoskeletal discomfort due to poor ergonomics, prolonged sitting, and limited movement [10]. Upper limb pain, especially in the neck, shoulders, and wrists, is a common result of poor posture and repetitive tasks, such as typing and using a computer mouse. Studies have shown that upper limb pain can lead to significant discomfort, reduced productivity, and decreased quality of life [11].

Lower back pain, although less commonly reported than upper limb pain, remains a major issue for many adults. Research indicates that lower back pain is one of the most prevalent musculoskeletal complaints globally, and it is often associated with sedentary lifestyles and improper ergonomics [12]. In the present study, the lower limb pain reported by 48.9% of participants is consistent with the growing body of evidence that highlights the high prevalence of lower back pain in adults, particularly among individuals who engage in prolonged sitting and lack regular physical activity [12].

2.2 Mental Health and Musculoskeletal Pain

The relationship between mental health and musculoskeletal pain is well-established in the literature. Psychological distress, particularly anxiety and depression, has been linked to the exacerbation of physical pain, including musculoskeletal discomfort. The results from the Depression, Anxiety, and Stress Scale (DASS-21) in the present study indicate that anxiety is more commonly reported than depression, with 5.7% of participants experiencing mild anxiety, and 8.0% suffering from moderate anxiety. These findings are in line with a significant body of research suggesting that anxiety disorders are more prevalent than depression in adult

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populations, particularly those experiencing physical discomfort [13]. Anxiety has been found to increase muscle tension, particularly in the neck, shoulders, and back, which can contribute to musculoskeletal pain and exacerbate existing discomfort [14].

Depression, although less prevalent in the current study (with only 4.5% of participants reporting mild depression), has also been shown to be a contributing factor to musculoskeletal pain. Several studies have suggested that individuals with depression experience a heightened sensitivity to pain, which may make them more susceptible to musculoskeletal discomfort [15]. Depression and chronic pain often form a vicious cycle, where pain exacerbates feelings of helplessness and low mood, which, in turn, can increase the perception of pain [16].

Stress, although less reported in the current study (with only 1.1% of participants experiencing mild stress), is another psychological factor that contributes to musculoskeletal pain. Stress is often associated with muscle tension, particularly in the upper body, and has been shown to increase the risk of developing musculoskeletal disorders. Rokach, A. found that individuals with high levels of stress were more likely to report musculoskeletal pain, especially in the neck and shoulders, as a result of muscle stiffness and tension. In the context of office workers, stress often arises from heavy workloads, tight deadlines, and poor work-life balance, which can lead to both physical and psychological health issues [17].

2.3 The Interplay Between Musculoskeletal Pain and Mental Health

The bidirectional relationship between musculoskeletal pain and mental health disorders, particularly anxiety and depression, has been well-documented. Anxiety increases muscle tension, which can exacerbate physical discomfort, particularly in the neck, shoulders, and back [14]. In the present study, a significant correlation between upper limb pain and anxiety was found, suggesting that participants with higher levels of anxiety were more likely to report discomfort in the upper limbs. This correlation is consistent with previous research, which has shown that anxiety-related muscle tension in the upper body can contribute to musculoskeletal pain [18].

Conversely, musculoskeletal pain, particularly chronic pain, can also lead to psychological distress. Individuals experiencing chronic pain often report higher levels of anxiety, depression, and stress, as the persistent nature of the pain can lead to feelings of helplessness and frustration [15]. The vicious cycle between musculoskeletal pain and mental health symptoms is evident in the present study, where participants with upper limb pain also reported higher levels of anxiety. This cycle may be particularly pronounced in individuals with chronic pain, where the physical discomfort further exacerbates mental health issues, and vice versa [16].

2.4 Lifestyle and Occupational Factors

Lifestyle factors, including sedentary behaviour and poor ergonomics, play a significant role in the development of both musculoskeletal pain and mental health issues. In the present study, participants reported higher levels of pain in the upper limbs, which could be attributed to sedentary work involving prolonged periods of sitting and repetitive movements such as typing and mouse use. Research has shown that individuals who engage in sedentary work are at a higher risk of developing musculoskeletal disorders, particularly in the upper body [19]. In addition, the lack of physical activity and poor ergonomics in the workplace can exacerbate musculoskeletal discomfort and contribute to the development of anxiety and stress [10].

Furthermore, occupational stress can also play a significant role in the development of both musculoskeletal pain and mental health issues. The pressure to meet deadlines, the demands of

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the work environment, and poor work-life balance contribute to both physical strain and psychological distress [17]. This highlights the importance of addressing both physical and psychological health in the workplace, with a focus on improving ergonomics, encouraging physical activity, and providing mental health support.

Despite the rising prevalence of mental health disorders and musculoskeletal discomfort in the post-pandemic era, there is a lack of integrated research focusing on the specific correlation between these two burdens within the Malaysian adult population. While previous studies in Malaysia have investigated mental health among specific groups like teachers or healthcare workers, they often overlook the physical musculoskeletal implications of such psychological distress. Conversely, ergonomic studies frequently focus on physical posture without accounting for the bidirectional role of anxiety and depression. There is currently no robust empirical evidence that quantifies how psychological variables—specifically depression, anxiety, and stress—linearly correlate with discomfort in specific body regions among general Malaysian adults. This study addresses this gap by using validated instruments (NMQ and DASS-21) to identify these associations, providing a necessary foundation for holistic workplace interventions.

3. METHODOLOGY

This study involved 88 Malaysian adult participants, comprising 49 men and 39 women, aged between 20 and 58 years. Participants were selected using a random sampling method without setting a predefined sample size, in order to ensure diversity and representativeness across the adult population. The inclusion criteria required participants to be Malaysian adults, while those with pre-existing severe musculoskeletal or mental health conditions diagnosed before the study were excluded to avoid confounding factors. Demographic information was collected using a standardized health form provided by the Department of Occupational Safety and Health (DOSH), which gathered relevant data such as gender, age, general health status, medication use, and other background factors (Department of Occupational Safety and Health Malaysia, 2020). Musculoskeletal health conditions were assessed using the Nordic Musculoskeletal Questionnaire (NMQ), a validated instrument widely employed in epidemiological research to detect musculoskeletal symptoms and their distribution across body regions [20]. In parallel, psychological well-being was evaluated using the Depression, Anxiety, and Stress Scale (DASS-21), a recognized and validated tool that offers a quantitative assessment of symptoms related to depression, anxiety, and stress [21].

Data analysis was conducted using statistical software to perform both descriptive and inferential analyses among filtered participants based on the NMQ and DASS-21 results. 35 participants produced MSD and psychological symptoms whose data were analyzed for correlation analysis further. Kendall's Tau-b (Tb) correlation was employed to evaluate the bivariate associations between psychological distress and the severity of musculoskeletal symptoms [22]. This non-parametric statistical method was selected as the primary analytical approach due to the ordinal nature of the data type. Specifically, the DASS-21 subscales (Depression, Anxiety, and Stress) were categorized into ordered severity tiers (Normal, Mild, Moderate, Severe, Extremely Severe), and the subjective musculoskeletal disorder (MSD) reports were similarly classified on a ranked symptom severity scale (No pain, Slight pain, Moderate pain, Severe pain). Furthermore, Kendall's Tau-b was deemed mathematically superior to other non-parametric alternatives such as Spearman's p for this specific cohort due to the underlying distribution of the responses. The dataset contained a high frequency of identical categorical scores among participants, most notably clustering in the "Normal" psychological categories and "No pain" musculoskeletal categories, which resulted in a substantial number of tied ranks. Kendall's Tau-b explicitly incorporates an adjustment for tied pairs in its calculation, yielding a more robust and accurate estimation of correlation under these conditions.

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4. RESULTS

4.1 Musculoskeletal Health Assessment

Figure 1 shows the results of Musculoskeletal Disorder Symptoms Scores from 88 participants in this study. The results from the Nordic Musculoskeletal Questionnaire (NMQ) were categorized into upper limb pain, i.e., neck, shoulders, upper back, elbows and wrists or hands, and lower limb pain, i.e., low back, hips or thighs, knees, and ankle or feet. Among the participants, 62 individuals (70.5%) reported experiencing mild pain in the upper limb region, while 5 participants (5.7%) reported moderate pain, and 1 participant (1.1%) experienced severe pain. The remaining 20 participants (22.7%) did not report any upper limb pain. Regarding lower limb pain, 43 participants (48.9%) reported experiencing mild pain, whereas 8 participants (9.1%) experienced moderate pain. The remaining 37 participants (42.0%) did not report any pain in the lower limb region. These findings indicate that musculoskeletal discomfort was more prevalent in the upper limbs compared to the lower limbs, with the majority of participants reporting mild pain.

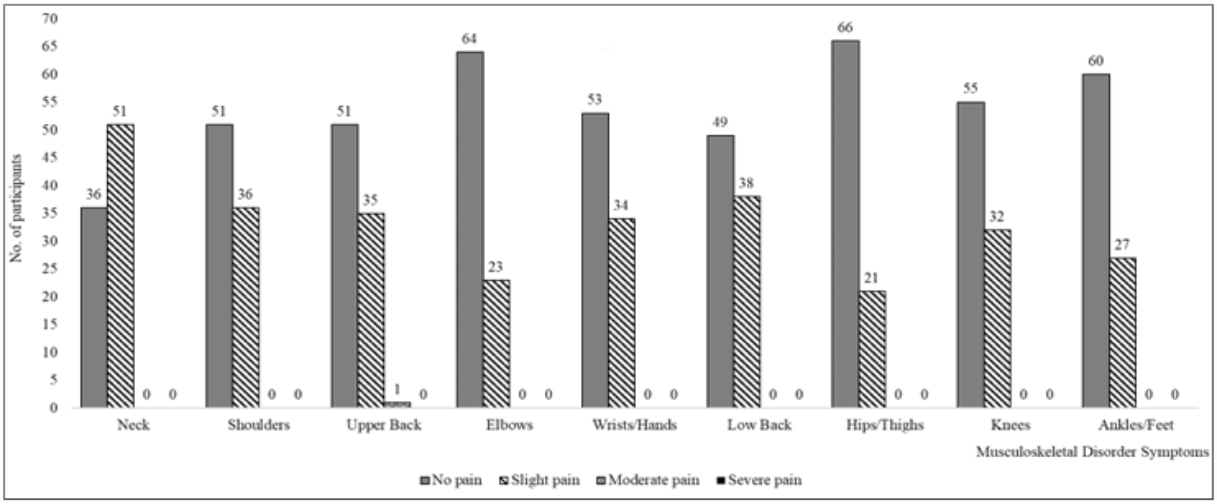

Figure 1. Prevalence and Severity of Musculoskeletal Symptoms across Nine Body Regions (N=88), categorized by the Nordic Musculoskeletal Questionnaire (NMQ) thresholds.

4.2 Mental Health Assessment

Figure 2 presents the results of DASS Scores among 88 participants in this study. The results from the Depression, Anxiety, and Stress Scale (DASS-21) provided insights into the psychological well-being of the participants. In terms of depression, 4 participants (4.5%) exhibited mild depression, while 2 participants (2.3%) reported experiencing moderate depression. Anxiety levels were more pronounced, with 5 participants (5.7%) reporting mild anxiety, 7 participants (8.0%) experiencing moderate anxiety, and 5 participants (5.7%) suffering from severe anxiety. Stress levels were comparatively lower, with only 1 participant (1.1%) experiencing mild stress and another 1 participant (1.1%) experiencing moderate stress. The majority of respondents (97.7%) fell within the normal threshold for stress. Overall, the results suggest a significant prevalence of musculoskeletal pain and psychological distress among participants. The findings highlight that upper limb musculoskeletal pain and anxiety symptoms were more commonly reported than other conditions. These results underscore the need for further investigation into the relationship between occupational and lifestyle factors, mental health, and musculoskeletal disorders.

4.3 Statistical Correlation Between DASS and Upper Limb Disorder

A Kendall's rank correlation coefficient (Tb) analysis was conducted to evaluate the strength and direction of the association between the severity of psychological distress (measured via the

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DASS-21 subscales for Depression, Anxiety, and Stress) and the severity of musculoskeletal disorder (MSD) symptoms across five upper limb regions. The complete matrix of correlation coefficients and corresponding significance levels is detailed in Table 1 and visually summarized in the correlation heatmap as shown in Figure 1. The analysis revealed a statistically significant, moderate positive correlation exclusively between all three psychological distress domains and the severity of upper back pain. Specifically, elevated symptom severity in the upper back demonstrated significant positive associations with Depression (Tb= 0.337, p = 0.040), Anxiety (Tb= 0.331, p = 0.039), and Stress (Tb = 0.337, p = 0.040). This indicates that participants experiencing higher categorical levels of psychological distress were significantly more likely to report more severe upper back musculoskeletal symptoms. Conversely, no statistically significant correlations were observed between the DASS-21 subscales and MSD severity in the neck, shoulders, elbows, or wrists/hands ($p > 0.05$). While weak-to-moderate positive trends were noted for the neck and shoulders across all psychological factors (e.g., Stress and Neck pain: Tb= 0.280, p = 0.081), these relationships did not reach the threshold for statistical significance in the current sample. Furthermore, associations involving the distal upper extremities (elbows and wrists/hands) exhibited negligible, non-significant negative coefficients (Tb ranging from -0.030 to -0.098). Overall, the heatmap highlights a localized psychosomatic vulnerability, suggesting that occupational or psychological stressors in this cohort are most distinctly manifested as upper back musculoskeletal discomfort.

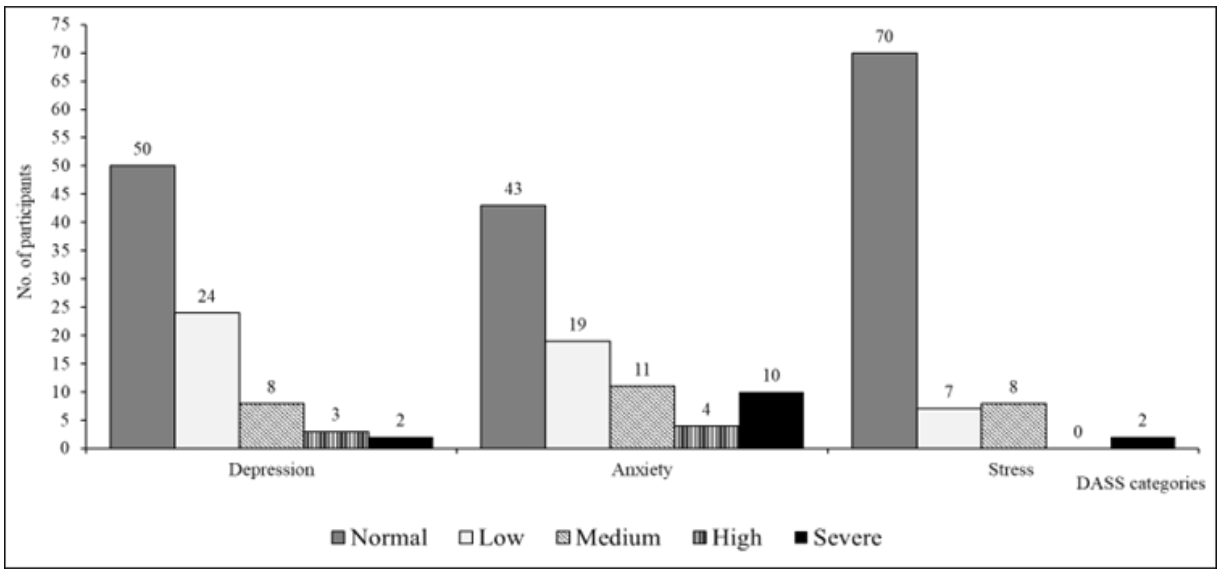

Figure 2. Distribution of Psychological Distress Levels (Depression, Anxiety, and Stress) among Malaysian Adults as measured by DASS-21.

The analysis of musculoskeletal symptoms in the lower limb regions, specifically the low back, hips or thighs, knees, and ankles or feet also yielded weak correlations with mental health variables. Hips or thighs pain showed the highest correlation with stress (r = 0.27), followed by depression (r = 0.23) and anxiety (r = 0.22), suggesting a weak positive association. Similar patterns were observed in the ankle or foot region, where depression (r = 0.29), stress (r = 0.22), and anxiety (r = 0.21) demonstrated weak but consistent relationships with reported discomfort. In contrast, knee pain exhibited the lowest correlation values among the lower limb regions, with stress (r = 0.13), anxiety (r = 0.17), and depression (r = 0.25) indicating minimal associations. Low back pain correlations were similarly weak across all variables: depression (r = 0.18), anxiety (r = 0.21), and stress (r = 0.22).

Across all musculoskeletal regions, the strongest correlation was observed between depression and wrist or hand symptoms (r = 0.34), indicating a weak to moderate positive linear relationship.

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This was followed by stress and wrist or hand symptoms (r = 0.31) and depression and neck symptoms (r = 0.33), suggesting that psychological factors may play a more pronounced role in musculoskeletal discomfort in specific upper limb areas. Conversely, the weakest correlation was found between stress and elbow symptoms (r = 0.06), indicating a virtually absent linear relationship. These findings underscore the variability in the strength of associations across body regions and highlight that while certain musculoskeletal symptoms may be modestly influenced by mental health status, others appear largely independent.

Table 1. Kendall's Tau-B Correlation Coefficients (Tb) Between DASS-21 Dimensions and Upper Limb Musculoskeletal Disorder (MSD) Severity (N = 35)

DASS	MSD Region	Kendall Tau-b (τ_b)	p-value	Significant (p<0.05)
Depression	Neck	0.28	0.081	No
Depression	Shoulder	0.22	0.173	No
Depression	Upper Back	0.337	0.04	**Yes**
Depression	Elbow	-0.042	0.806	No
Depression	Wrist/Hand	-0.096	0.561	No
Anxiety	Neck	0.11	0.482	No
Anxiety	Shoulder	0.184	0.244	No
Anxiety	Upper Back	0.331	0.039	**Yes**
Anxiety	Elbow	-0.098	0.559	No
Anxiety	Wrist/Hand	-0.03	0.854	No
Stress	Neck	0.28	0.081	No
Stress	Shoulder	0.22	0.173	No
Stress	Upper Back	0.337	0.04	**Yes**
Stress	Elbow	-0.042	0.806	No
Stress	Wrist/Hand	-0.096	0.561	No

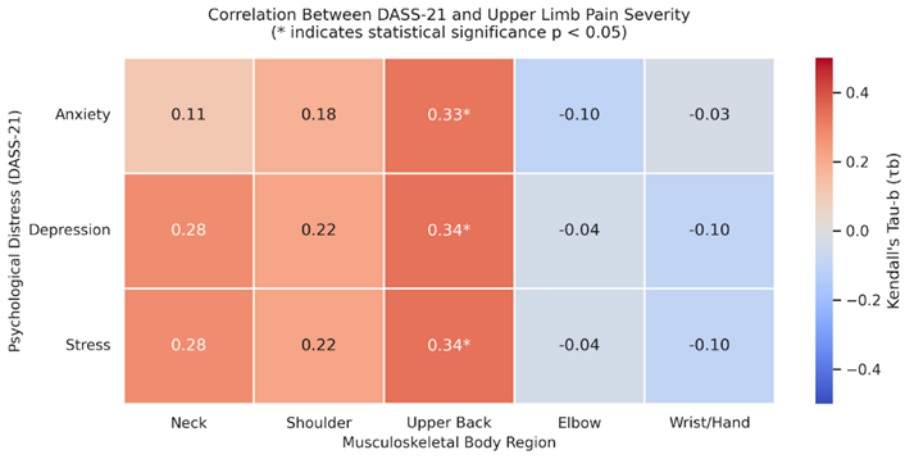

Figure 3. Correlation heatmap based on the Kendall's tau-b (Tb) between MSD and DASS

5. DISCUSSION

The current study aimed to evaluate the prevalence of musculoskeletal disorders (MSDs) and mental health conditions among Malaysian adults, as well as to investigate the correlational dynamics between these two health domains. The findings demonstrated a substantial prevalence of upper limb musculoskeletal symptoms, alongside notable levels of psychological distress, particularly anxiety. Crucially, the correlation analysis revealed a highly specific,

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statistically significant positive association between all measured dimensions of psychological distress; depression, anxiety, and stress and the severity of upper back pain.

Consistent with existing ergonomic literature, the subjective reporting of musculoskeletal pain among participants was predominantly localized in the upper body, with 70.5% of participants experiencing mild symptoms. This high prevalence aligns with previous assertions that upper body musculoskeletal symptoms are frequently exacerbated by contemporary work-related factors, such as prolonged sitting, poor posture, and repetitive movements typical of sedentary professions [8]. Concurrently, the psychological assessment indicated that anxiety was the most prevalent mental health issue within this population, affecting nearly 20% of respondents at varying severity levels. This finding corroborates observations that working-age adults face elevated psychological distress, a condition that was further exacerbated by recent pandemic-related restrictions and occupational demands [1-3][6].

The most salient finding of this investigation is the significant moderate positive correlation between psychological distress and upper back pain. While previous literature frequently associates psychological stress and anxiety with generalized muscle tension in the neck and shoulders, this study highlights the upper back as a primary somatic locus for psychological distress in this specific Malaysian group [5]. Individuals reporting higher categorical levels of depression, anxiety, and stress were significantly more likely to experience more severe upper back discomfort [8]. Interestingly, while weak-to-moderate positive trends were observed for the neck and shoulders, these did not reach statistical significance, and distal regions such as the elbows and wrists/hands showed negligible, non-significant negative correlations.

These results strongly support the presence of a bidirectional relationship between musculoskeletal discomfort and mental health. Psychological distress, particularly anxiety, is known to induce physiological responses such as increased muscle tension, which can directly contribute to or exacerbate musculoskeletal pain [22]. Conversely, the persistent experience of physical pain can diminish overall quality of life and induce feelings of helplessness, thereby elevating vulnerability to depression and anxiety. The specific vulnerability of the upper back observed in this study suggests that occupational stressors and poor ergonomic setups may synergistically amplify physical strain and psychological load, creating a vicious cycle of discomfort. From an ergonomic and occupational health perspective, these findings emphasize that traditional physical interventions such as localized workstation adjustments may be insufficient when designed in isolation. The significant interplay between mental health and MSDs necessitates the implementation of integrated workplace health programs. By simultaneously addressing biomechanical risks through ergonomic improvements and providing robust mental health support, organizations can more effectively mitigate the dual burden of musculoskeletal and psychological disorders among working-age populations.

6. CONCLUSION

This cross-sectional investigation establishes a significant intersection between musculoskeletal disorders and mental health conditions among working-age Malaysian adults, highlighting a substantial prevalence of both upper limb discomfort and psychological distress, particularly anxiety. The correlation analysis uniquely identified the upper back as a highly vulnerable psychosomatic region, demonstrating a statistically significant, moderate positive association with elevated levels of depression, anxiety, and stress. These findings empirically reinforce the bidirectional nature of occupational health challenges, wherein psychological distress can manifest as or exacerbate physical pain, and persistent physical discomfort can subsequently degrade mental well-being. Consequently, mitigating these contemporary health burdens requires a paradigm shift away from isolated treatments; organizations and public health policymakers must prioritize holistic, integrated interventions that concurrently optimize physical ergonomic environments and provide structured mental health support systems.

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